

BY PETER KONJOIAN AND JOHN ERWIN

# Scientific Discovery's Moment of Excitement



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**T**oday's guest is John Erwin, professor of environmental physiology, ornamental crop production and controlled environment agriculture at the University of Maryland. John received degrees from Delaware Valley College and Michigan State University. After graduating from Michigan State, he became a faculty member at the University of Minnesota, where he worked for 30 years.

Last year, John became the chair of the Department of Plant Science and Landscape Architecture at the University of Maryland. Aside from his university work, he was an elected Park Commissioner for 12 years, and has been an industry crop production consultant for 32 years.

**Peter:** Congratulations on becoming chair of your department at Maryland. Get us started with a review of your research as a graduate student and faculty scientist.

**John:** Before I mention my work at Minnesota, I want to acknowledge my former major professor at Michigan State, Royal Heins. While there, Royal, other grad students and I came up with the concepts of DIF, DROP and DIP that

are used today for non-chemical height control. I am very proud of that work.

While at the University of Minnesota, I worked to identify lighting requirements used today to schedule bedding and potted plant flowering including over 80 species of cacti and succulents. Other areas I worked on include CO<sub>2</sub> and temperature requirements to maximize leafy green production and nutritional value, utilization of natural defense responses in plants to reduce pesticide use, PGR combinations to reduce labor costs and/or improve crop quality and sell through, and, recently, how pot and media heating reduces growth of containerized plants.

**Peter:** Your acknowledgement of Royal's impact on your graduate training is a testament to the program he built. I enjoy watching academic colleagues passionately embrace the privilege of advising at the graduate level. Often, those advisors were graduate students of our best advisors themselves. Apples not falling far from trees, right?

**John:** I am incredibly proud that five of my former students are university faculty members. At Maryland I plan to continue my research program — I have no plans to slow down — I already have a new grad student. Maryland has a rich history in floriculture; it is the "birthplace of photoperiodism" used in floriculture today to schedule bedding and potted plants. Much of the lighting work used today was originally developed at Maryland, and the University of Maryland has produced tremendous graduates who are changing the world! You spent some time here, Peter.

**Peter:** Indeed, Maryland's floriculture history makes it a special place. Coming out of my Ohio State graduate program, I took a position at Maryland in 1982 following Jim Shanks' retirement. He and Conrad Link anchored some of the work

you cite, their names became one in the world of poinsettia research. Even though they were both retired they took me under their collective wings introducing me to growers across the state.

I'd like you to describe how it felt when you realized that DIF was a thing, that you were on to something important. I experienced the feeling on a smaller scale during my work on the beneficial effects of ethylene (Florel) on ornamental crops. What was that moment of discovery like?

**John:** I was taking pictures of plants at the end of an experiment, and I noticed this crazy thing that plants with the same DIF had the same height regardless of temperature. I called Royal and asked him to come down right away. After scratching our heads for a while, we realized we were on to something. The same thing happened with DIP; the results showing that temperatures at the beginning of the day were really important in stem elongation was really obvious.

**Peter:** The "aha" moment of scientific discovery. Those lucky enough to experience one understand how special it is. Coincidentally, mine also came while taking pictures, I remember it vividly. It was 1988 — an experiment with trailing lantana looking at various Florel treatments. Treated plants were completely vegetative, branching at every node, more than any pinched treatment. Control plants with hardly a lateral branch in full flower.

I couldn't keep the camera stable; one shot in particular still ranks among my favorite research images. I call them money shots. We shot film back then, you probably did, too ... it took a week for the slides to arrive, which was torture. I knew I was on to something as you knew when you called Royal down to the greenhouse that day. I was working alone, however. My moment was internal but still incredibly memorable.

**John:** Another exciting aspect of the project was learning we weren't done at DIF. DIP results also made a lot of sense because we were hearing and seeing that growers with a shade cloth system, like Andy Mast, were getting a much bigger response to DIF.

The DIP experiment explained it all!

The same thing happened in Minnesota with lighting and bedding plants; in one experiment, we saw that like three-fourths of the species we tested were photoperiodic and no one really appreciated it! Seeing the interest in DIF and bedding plant lighting at both academic and industry meetings was incredibly exciting to me and can keep you motivated. You witnessed continued discovery with Florel too, correct?

**Peter:** First, your point that following DIF with DIP was as or even more exciting is another powerful level of discovery. When Florel led me to garden mums to uncover its control over the shift from vegetative to reproductive growth even in photoperiodic plants the project produced another money shot, one with lots of Powerpoint mileage.

Second, how coincidental that the two of us worked on flowering from different perspectives. Figure 1 (above) shows two chrysanthemum plants that both received the standard two weeks of long days followed by short days. The plant on the left flowered as scheduled, while the Florel treated plant did not flower even under inductive short days. Ethylene outmuscled photoperiod. Your work focused on getting plants to flower sooner, mine on keeping them vegetative longer.

Okay buddy, all this said, how do we help our next generation researchers find the discovery we've been fortunate to experience? You're on the

other side of university life as a department chair now. How will you mentor young researchers to build programs that foster the kind of scientific discovery that you and I and others have been so fortunate to experience?



**John:** Sometimes we spend so much time writing grants that we forget that we got into this business because we love science, doing experiments and seeing things we learned being used. I think it is really important for scientists to get out to farms, greenhouses and nurseries where they can get ideas, see their work, and recommendations being used to successfully grow crops. It can be really inspiring for a scientist; it was for me with DIF and when growers were lighting bedding plants to get them to bloom early.

**Peter:** Great point, John — one we hear growers describe too. As their operations grow, they find themselves behind a desk rather than doing what they love, growing crops in the greenhouse. Researchers who make the effort to stand in growers' greenhouses reap dividends for the time they invest. I grew up on a farm and in a greenhouse, and when I arrived at Ohio State, Kip, my advisor, knew my DNA. Harry Tayama immersed me in OFA at the highest levels of our industry.

Royal studied under Harold Wilkens who taught him to connect with growers. He joined Will Carlson at Michigan State and strengthened his industry connection. Harry and Will, Ohio State and Michigan State,

OFA and BPI ... how cool it was to be part of that era of industry emergence?

**John:** A bonus is that strong connections between academics and industry can strengthen a bond that can result in direct industry support of research, as well as bring industry partners into the scientific discovery process, which can be really gratifying too on both sides.

**Peter:** Well said, and a point I also pass along to our next generation researchers. Make the effort to understand what growers experience, ask questions and appreciate their world. It will make you a better researcher. Understanding how growers think goes a long way in guiding our research. I doubt I'd have discovered Florel's effects on so many crops had I not been in my commercial greenhouse setting pinching hanging baskets and garden mums thinking there must be a better way.

And to reinforce your industry partner comment, most of the funding for the Florel project was direct from fellow growers around the country and Canada. I'm grateful for that bond that you describe; the project would not have achieved the success it did without their support. Lastly, as you learn more about how plants interact with their environment, tell us how greenhouse growers and farmers will monetize the knowledge that comes with these scientific discoveries.

**John:** Lately, researchers are focusing on how to decrease labor costs and increase sell through when selling crops with "pay by scan." For instance, new PGR combos can reduce pinching, reduce crop time, and increase postharvest life and sell through — all making a crop more profitable. Making plants flower when you want them to sell increases sales. New LED lighting treatments

may increase crop postharvest life to increase sell through. New temperature and light regimes can increase the nutritional value of greens, allowing for a higher price point and decrease production time. New crops allow growers to receive higher prices per pot or square foot compared to the more traditional crops. Strategies to keep herbs vegetative vastly improves performance and increases quality and sales. All of these result in an increase in profitability to growers.

**Peter:** How exciting, right? What separates botany from horticulture in my opinion is that the botanist studies how plants grow and the horticulturist studies how to grow plants for profit. I'll end with a "4M" comment. You were trained in Michigan and conducted much of your flowering research in Minnesota; I conducted mine in Massachusetts. Our careers crossed in Maryland, in your words floriculture's birthplace of photoperiodism. How'd that happen?

This was a lot of fun, John. Thanks for spending time with me on this topic. [gpn](#)

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